THE U.S. NAVAL OBSERVATORY

STAR

Volume 9, Number 2 29 June, 2000

The Captain's Corner

CAPT Ben Jaramillo, Superintendent

It has been a busy and productive five months and now summer is finally upon us. The myriad and diversity of the events that have taken place in the short time I have been here continue to impress me. The highly successful IAU Colloquium, the Navy-Marine Corps Relief Society Fund Drive, the blood donation drive, several farewell luncheons and the continuing professional lecture series are a few examples of our diversity at USNO. Our very successful Open House was well attended by the general public and came off without a hitch thanks to the many staff members who volunteered their time. Your contributions to the planning and success of these events has been outstanding and has not gone unnoticed. WELL DONE to all!

As we move through the spring into summer, the pace will not slow down. Planning is now beginning for the official millennium event of Dec 31, 2000. If you have any ideas or want to participate in the planning please see Dr. Dick or the XO. I am sure there are more events being planned that will involve most of us.

As summer brings on plans for vacations and summer projects, I ask that you all keep in mind "safety first". Summer is a great time to take advantage of vacation time and to enjoy well deserved time with friends and family. Be safe, have a great time and I will see you during my afternoon walks around USNO.

In This Issue:

Meet the XO...

CDR Doug Groters

Commander Douglas J. Groters was born in Zeeland, Michigan and attended Zeeland Public High School prior to entering the Naval Academy in 1978. Following a course of study focused on Physical Oceanography, Commander Groters was commissioned as Ensign in May 1982.

After training at Surface Warfare Officer's School, Coronado, CA, Commander Groters reported to USS FIFE (DD-991), where he served as ASW Officer and Damage Control Assistant until April 1986. He then reported to the Naval Postgraduate School, Monterey, CA where he completed Masters degrees in Meteorology and Physical Oceanography. In January 1988 while assigned to NPGS, Commander Groters was selected for redesignation into the Meteorology and Oceanography (METOC) community.

From August 1988 to October 1991, Commander Groters served as Staff Oceanographer for the Naval Operational Intelligence Center. His analyses, while assigned to the Submarine Warfare Operations Research Department (SWORD), provided significant tactical benefit to the submarine community.

In November 1991, Commander Groters assumed charge of the Naval European Meteorology and Oceanography Detachment, Sigonella, Italy. While under his charge the Detachment was nominated for and received both the COMNAVMETOCCOM Unit Achievement Award and the Meritorious Unit Commendation for their support to Operations PROVIDE PROMISE and DENY FLIGHT.

Following his tour of duty overseas, Commander Groters was assigned as the Staff METOC Officer to Commander, Carrier Group Six. During his tour, he served as Battlegroup Staff Tactical Action Officer

onboard USS AMERICA (CV-66) and participated in Operation DELIBERATE FORCE in the Adriatic Sea.

In June 1997 Commander Groters transferred to the Naval Atlantic Meteorology and Oceanography Facility, Jacksonville, Florida where he served as Executive Officer until January 2000. He is the Deputy Superintendent of the Naval Observatory, Washington D.C.

Commander Groters' personal awards include the Navy Commendation Medal with Gold Star in lieu of third award, the Navy Achievement Medal and various service medals and unit awards.

FROM THE XO...

I would like to take an opportunity to introduce myself and say how great it is to be associated with a tremendously successful and vital institution. With each passing day, I am appreciating, to a greater degree, the fascinating and vital work that we do here at USNO.

Each of you is a valuable member of our team. I would like to take a few minutes to define value and provide some thoughts on how you can become more valuable to our team. Three areas that can significantly increase ones perceived value to an organization are: commitment to **integrity**, commitment to **enthusiasm** and commitment to **change**.

We all hear about the importance of integrity but sometimes understanding that word and the working out of integrity in our daily lives is a little less cut and dried. I tell my kids to simply do what they say they are going to do. If we claim a specific value structure and we verbalize those values to others then our actions should be a demonstration of those values. This is integrity. One thing I have learned about people of integrity... they are easily trusted. If an organization cherishes and fosters integrity in their personnel, they will develop a solid foundation of trust and the potential for significant growth is exponentially heightened. At the end of today will you have made deposits into your "Integrity Bank" or withdrawals?

Enthusiasm is a combination of two Greek words that literally means "God-filled". What does it mean to be enthusiastic? One might think of it like this. If you have an idea that you formulate into a vision and you proceed to set goals to accomplish your vision, the enthusiastic person approaches those goals as if there is nothing that can stop them. They maintain a positive attitude no matter what the circumstances and they choose to never give up. Maybe step back, maybe regroup, maybe rethink, but never retreat to mediocrity. These people embody the spirit of enthusiasm and perseverance.

Change is something most people fear and yet everyone lives with change each and every day of their lives. How we view change and how we manage change in today's world may well determine our ability to live and contribute successfully. Spencer Johnson recently wrote a book entitled "Who Moved My Cheese?" It is a humorous but thought provoking story about two mice and two little people living in a maze. It is a story of how these people and mice deal with change. It is a fascinating allegory on human life and the principles communicated are worthy of thought. I would encourage each of you to read this book as you have opportunity.

The Observatory has undergone a period of significant change over the last few years as has most of the Navy. I suspect that the changes will continue to come our way with greater frequency as we embrace new technologies and new ways of doing business. Our commitment to integrity and enthusiasm and our ability to accept, embrace and capitalize on these changes will determine the effectiveness of our organization.

PLUMBING THE DEPTHS OF POLARIS

Tyler Nordgren, USNOFS

The Navy Prototype Optical Interferometer (NPOI), an array of telescopes possessing the resolving capability of a single 38-meter (125-foot) optical telescope, has revealed that Polaris is 46 times larger than our own Sun. This unprecedented direct radius measurement, presented today at the American Astronomical Society meeting in Rochester, NY, is precise enough to reveal important clues to the star's

internal structure. Long known to be a "Cepheid" variable star, this new measurement confirms that Polaris is a Cepheid of a very unusual nature.

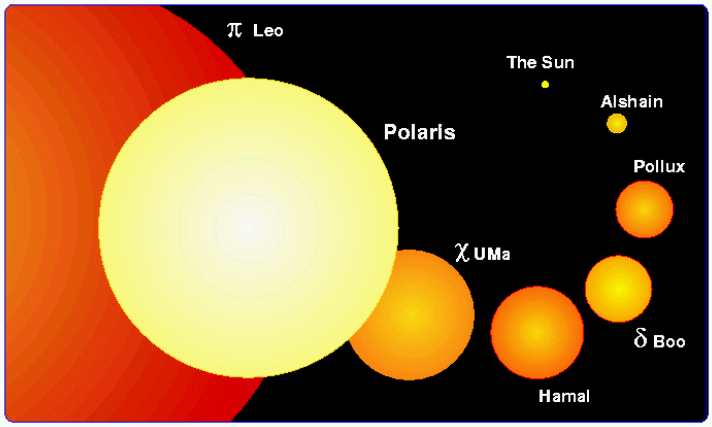
Polaris is located 431 light years away from the Solar System in the constellation of Ursa Minor (the Little Bear) often called the Little Dipper. Because of its nearly direct position over the Earth's North Pole, Polaris holds a nearly fixed position in the night sky, making it a navigation reference long used by sailors, campers, and sky watchers.

Cepheid variables, named after the first one discovered in the constellation Cepheus, are pulsating stars that change their brightness in a regular periodic way, unlike our Sun, an ordinary star whose light output over the eons has been nearly constant. In the early 1900's, Henrietta Leavitt of the Harvard College Observatory discovered that there is a relation between the length of a Cepheid's pulsational period and its total light output, or luminosity: stars with longer periods were inherently brighter than ones with shorter periods. Astronomers have also known from theory and indirect estimates of the sizes of Cepheids that, like the relation between pulsational period and luminosity, there is also a relation between period and radius, with larger Cepheids having longer periods. Cepheids are giant stars with luminosities several thousand times greater than the Sun, and can thus be used as a kind of "standard candle" for determining large distances in the Cosmos. In fact, a key project of NASA's Hubble Space Telescope is to discern Cepheids in distant galaxies and thus determine the size of the Universe.

Cepheids get brighter and dimmer because they constantly change size. A complex series of events deep in the atmosphere of these stars causes the outer layers of the stellar atmosphere to alternately expand and contract. Usually all the material in the outer atmosphere moves in the same direction at the same time. Imagine pulling on a spring with one end held fixed to a table. While the fixed end remains constant (the deepest layers) the other end moves back and forth (the surface). This is called fundamental mode pulsation.

The NPOI observations of Polaris directly confirm a discovery by a team of African and European astronomers in 1997 that Polaris is an "overtone pulsator". In other words, when Polaris pulsates, not all of its atmosphere moves in the same direction at the same time.

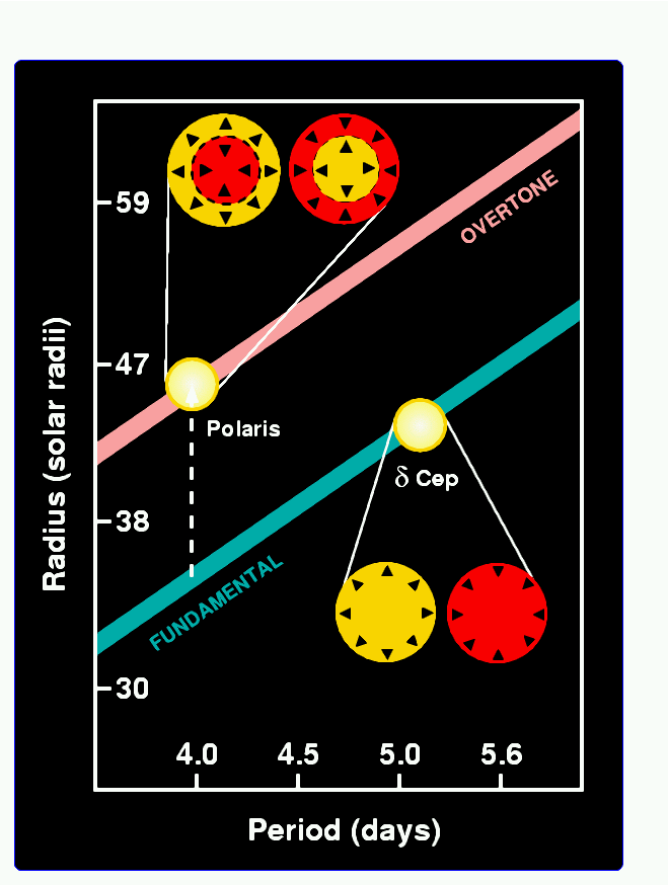
"By comparing the radius of Polaris to predictions for fundamental pulsation we were comparing oranges to grapefruits. They may look similar on the outside, but the difference in size told us there is something very different on the inside" says Dr. Robert Hindsley, a team member and long-time Cepheid investigator with the Naval Research Laboratory in Washington D.C.



Seven stars observed by the NPOI are shown with their measured relative sizes. For comparison our own Sun is shown to the same scale. Relatively small Alshain, a third magnitude star in the constellation of Aquila the Eagle, is only three times larger than the Sun. The red giant p (Pi) Leonis in the constellation of Leo the Lion has a radius 80 times larger than our own Sun. In the middle is Polaris, which is 46 times the size of our Sun.

For a few Cepheids the internal dance of gases is more complicated. At a particular depth in the atmosphere there is a boundary, called a node, inside of which all the gas moves in one direction while outside the gas moves in the opposite direction. In this case, while one hand pulls the end of the spring back and forth, the other hand pulls on the middle of the spring in the opposite direction. This type of pulsation is called "first overtone pulsation". Since the physics differs between these two kinds of pulsation, there are different period-radius relationships for fundamental and overtone pulsators. From this difference astronomers at the U.S. Naval Observatory have confirmed which type of pulsation is at work in Polaris.

The NPOI observations for Polaris show that the North Star has a radius of 46 ±3 solar radii. With an observed period of four days, theories say that if Polaris is a fundamental mode pulsator, like most Cepheids, it should only have a radius of 38 solar radii. The period-radius relation for overtone pulsators, however, predicts larger radii for Cepheids at all periods. When compared with this other period-radius relation the observed large radius for Polaris is in perfect agreement

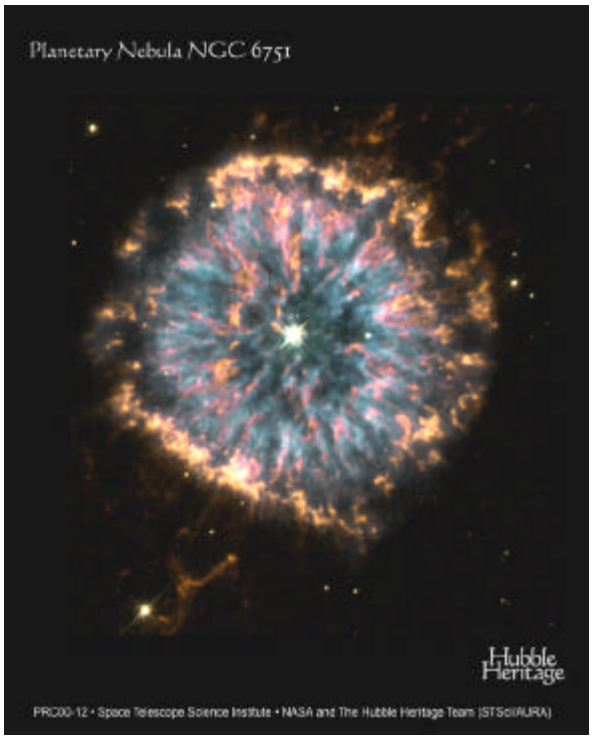


The relations between period and radius are shown for cepheid variable stars. The prototype cepheid variable, Delta Cephei, was measured by the NPOI to have a radius of 44 solar radii (44 times larger than our Sun). At a period of 5.3 days it agrees perfectly with the predicted size for fundamental mode pulsators (blue band). As shown in the lower right, this means all material in the outer atmosphere move outward or inward at any one time. Polaris, at a radius of 46 solar radii and period of 4.0 days is too large for a fundamental mode cepheid. However, the difference in size, shown by the dashed line, reveals the inner structure of the cepheid. Polaris agrees perfectly with the predictions for overtone pulsators (pink band). This result confirms that different depths in the atmosphere move in different directions (shown in the upper left).

USNO Astronomer Uses HST to Capture the Glowing Eye Of NGC 6751

USNO Public Affairs Office

A team of astronomers led by Arsen Hajian of the U.S. Naval Observatory, using NASA's Hubble Space Telescope, have obtained images of the strikingly unusual planetary nebula, NGC 6751. Glowing in the constellation Aquila like a giant eye, the nebula is a cloud of gas ejected several thousand years ago from the hot star visible in its center.



Planetary Nebula NGC 6751
Credit: NASA, The Hubble Heritage Team (STScI/AURA)

The Hubble observations were obtained in 1998 with the Wide Field Planetary Camera 2 (WFPC2). The Hubble Heritage team, working at the Space Telescope Science Institute in Baltimore, has prepared this color rendition by combining the Hajian team's WFPC2 images taken through three different color filters that isolate nebular gases of different temperatures.

"Planetary nebulae" are named after their round shapes as seen visually in small telescopes, and have nothing else to do with planets. They are shells of gas

thrown off by stars of masses similar to that of our own Sun, when the stars are nearing the ends of their lives. The loss of the outer layers of the star into space exposes the hot stellar core, whose strong ultraviolet radiation then causes the ejected gas to fluoresce as the planetary nebula. Our own Sun is predicted to eject its planetary nebula some 6 billion years from now.

The nebula shows several remarkable and poorly understood features. Blue regions mark the hottest glowing gas, which forms a roughly circular ring around the central stellar remnant. Orange and red show the locations of cooler gas. The cool gas tends to lie in long streamers pointing away from the central star, and in a surrounding, tattered-looking ring at the outer edge of the nebula. The origin of these cooler clouds within the nebula is still uncertain, but the streamers are clear evidence that their shapes are affected by radiation and stellar winds from the hot star at the center. The star's surface temperature is estimated at a scorching 140,000 degrees Celsius (250,000 degrees Fahrenheit).

Security Notes

USNO POLICE EMERGENCY NUMBERS

34th Street Gate (24 Hours): 762-1468

Shift Lieutenant: 762-0336

Shift Sergeant: 762-0338

Local Emergency Number: Dial 99 + 911.

When calling the local emergency number please notify the USNO police in order to escort the emergency personnel and vehicles to the scene.

GATES (Hours of Operation):

34th Street Gate: Open 24 Hours/7 Days Per Week

South Gate: Open Monday through Friday, 0545 - 1830

Wisconsin Gate: Closed until further notice

Davis Street Gate: Closed

Gilliss Avenue Gate: Opened as Directed, otherwise closed

Wisconsin Turnstile: 24 Hours Daily (Must have USNO Swipe Card to re-enter)

USNO In The News

Geoff Chester, Public Affairs

The Year 2000 hubbub has faded away into a distant memory, but USNO continues to be featured in national news stories.

The unusual Leap Year of 2000 drew a huge amount of public inquiry, which culminated in USNO PAO Geoff Chester making an appearance on the NBC News ***Today*** Program to explain the once-every-400-years event to Matt Lauer. The planetary "alignment" of early May was also a source of constant query, with several local and regional film crews descending on the Observatory for the "definitive" answer to the End-of-the-World pundits.

The two news items in this issue of the *Star* from staffers Arsen Hajian and Tyler Nordgren also received publicity in the national media, and the late June announcement of the possibility of water on Mars featured an interview with Historian/PAO Steve Dick on the discovery's significance in the search for life beyond Earth.

Today ***Show's Matt Lauer poses with Geoff Chester's traveling companion Flat Mason after the 29 February 2000 "Leap Year" interview***

ABSTRACTS OF RECENT PAPERS:

PHOTOSPHERIC SPOTS AND A CHROMOSPHERIC PLAGE ON V523 CASSIOPEIAE

Dr. Nicholas Elias, USNOFS-NPOI

Submitted to the *Astrophysical Journal*

ABSTRACT:

The cool over-contact close-binary V523 Cas was observed with the 1-meter reflector at the United States Naval Observatory, Flagstaff Station. The photometry is very good, with a precision on the order of a few mmag, but not numerous enough for complete light-curve analyses (e.g., differential corrections). A conventional published synthesis has been found acceptable as a fiducial model, and most of the observational weight has been used to develop a spot model for the stars and to support the validity of theoretical limb-darkening coefficients.

Both photospheres and chromospheres contribute to the model. This result indicates that multi-filter measures of this and similarly cool binaries are necessary for fuller descriptions of stellar-activity cycles. A number of newly determined times of minimum light solidify the published rate of period variability.

DETERMINING A UT1-LIKE QUANTITY BY COMPARING OBSERVED GPS ORBITS TO NUMERICALLY-PROPAGATED MODELS OF ORBIT PLANES

Peter Kammeyer, Earth Orientation Department, USNO

Submitted to *Celestial Mechanics and Dynamical Astronomy*

ABSTRACT:

This paper studies a UT1-like quantity, UTGPS, determined from GPS satellite orbits obtained from the International GPS Service (IGS). Each orbit considered is transformed, using observed polar-motion parameters and an a priori UT1-UTC, from Earth-referenced to inertial coordinates. The ascending node of the transformed orbit forms with the ascending node of a modeled orbit plane an angle equal to the difference of two error angles. One error angle is the error in the a priori UT1-UTC; the other is the error in the ascending node of the modeled orbit plane.

In determining UTGPS, the modeled orbit plane is propagated using standard models of gravitational forces and an orbit-normal component of radiation pressure acceleration obtained from in-flight experience.

This component depends on the satellite's position relative to the Sun direction. UTGPS-UTC is the median of linear combinations of three quantities: the measured difference of error angles for a satellite, a model of its ascending-node error angle, and the a priori UT1-UTC. After an interval of one to four weeks, the rms difference of UTGPS-UT1 from its value at the beginning of the interval is approximately 30 microseconds times the square root of the interval's duration in weeks.

SPECKLE INTERFEROMETRY AT THE U.S. NAVAL OBSERVATORY, IV.

Geoffrey G. Douglass, Brian D. Mason, Marvin E. Germain, & Charles E. Worley

***Astronomical Journal*, Sep 1999, Vol. 118, P. 1395**

ABSTRACT:

The results of 1,314 speckle-interferometric observations of 625 binary stars, ranging in separation from 0.2 to 5.2 arcseconds with a limiting secondary magnitude of V=11 are tabulated. These observations were obtained using the 66 cm refractor at the U.S. Naval Observatory in Washington, D.C., with an intensified CCD (ICCD) detector. This is the fourth in a series of papers presenting measures obtained with this equipment, and covers the period January 1, 1997 through December 31, 1997. Random errors for all measures are estimated to be 18 mas in separation, and 0.57 deg/ρ in position angle, where ρ is the separation in arcseconds.

ICCD SPECKLE OBSERVATIONS OF BINARY STARS. XXIII. MEASUREMENTS DURING 1982--1997 FROM SIX TELESCOPES, WITH 14 NEW ORBITS

William I. Hartkopf, Brian D. Mason, Harold A. McAlister, Lewis C. Roberts, Jr., Nils H. Turner, Theo A. ten Brummelaar, Cristina M. Prieto, Josefina F. Ling, Otto G. Franz

Accepted for publication in the *Astrophysical Journal* (June, 2000)

ABSTRACT:

We present 2,017 observations of 1,286 binary stars, observed by means of speckle interferometry using six telescopes over a 15-year period from April 1982 to June 1997. These measurements comprise the 23rd installment in CHARA's speckle program at 2- to 4-m class telescopes,and include the second major collection of measurements from the Mt. Wilson Hooker 100-inch telescope. Orbital elements are also presented for 14 systems, 7 of which have had no previously published orbital analyses.

THE FIFTH CATALOG OF ORBITS OF VISUAL BINARY STARS - MAKING THE GRADE

W.I. Hartkopf, B.D. Mason

Poster: April 2000 DDA meeting, Yosemite, CA

ABSTRACT:

With 17 years having passed since the 1983 Worley & Heintz "Fourth Catalog of Orbits of Visual Binary Stars", the time is ripe for a new compilation. This "Fifth Catalog" will be maintained and regularly updated on the USNO website; however, due to the long interval since the previous publication, a paper version will be produced this year, as well. We anticipate that the new catalog will be some 30-40% larger than the Fourth and will include major revisions to many of the orbits published therein. The Fifth will also include ephemerides and figures for all orbits. A sample page of the new catalog is presented; suggestions are welcomed regarding format and further information to be included.

A major component in the production of a new catalog is the determination of grades for each orbit. The W&H grading scheme was based on orbital coverage, number of observations, and their overall quality, and presented on a numerical scale (1=definitive to 5=indeterminate), based on the accumulated experience of the authors and their qualitative assessment of individual observers. While useful for judging the reliability of a given orbit, this scheme was rather subjective, so difficult to duplicate by other cataloguers. A more objective scheme has been explored, which includes weights for each observation (based on grades determined for each observer), weighted rms theta and rho residuals, total number of observations, phase coverage, and other factors. W&H orbits are evaluated by this scheme, using data available at the time of the Fourth Catalog, to determine the correlation between our criteria and the W&H grades. As the final grading scheme has not yet been "written in stone", suggestions are also solicited for other potential grading criteria.

Finally, the problems of grading astrometric orbits, combined solution orbits, and orbits from long-baseline optical interferometry are also discussed.

COMPARING TYCHO--2 ASTROMETRY WITH UCAC1

N. Zacharias, M.I. Zacharias, and S.E. Urban

Submitted to the *Astronomical Journal*

ABSTRACT:

The Tycho--2 Catalogue, released in February 2000, is based on the ESA Hipparcos space mission data and various ground--based catalogs for proper motions. An external comparison of the Tycho--2 astrometry is presented here using the first U.S. Naval Observatory CCD Astrograph Catalog (UCAC1). The UCAC1 data were obtained from observations performed at CTIObetween February 1998 and November 1999, using the 206 mm aperture 5--element lens astrograph and a 4k x 4k CCD. Only small systematic differences in position between Tycho--2 and UCAC1 up to 15 milliarcseconds (mas) are found, mainly as a function of magnitude.

The standard deviations of the distributions of the position differences are in the 35 to 140 mas range, depending on magnitude. The observed scatter in the position differences is about 30% larger than expected from the combined formal, internal errors, also depending on magnitude.

The Tycho--2 Catalogue has the more precise positions for bright stars (V$\le 10^{m}$) while the UCAC1 positions are significantly better at the faint end ($11^{m} \le V \le 12.5^{m}$) of the magnitude range in common. UCAC1 goes much fainter (to R$\approx 16^{m}$) than Tycho--2; however complete sky coverage is not expected before early 2003.

THE FIRST USNO CCD ASTROGRAPH CATALOG

N. Zacharias, S.E. Urban, M.I. Zacharias, D.M. Hall, G.L. Wycoff, T.J. Rafferty, M.E. Germain, E.R. Holdenried, J.W. Pohlman, F.S. Gauss, D.G. Monet and L. Winter

Submitted to the *Astronomical Journal*

ABSTRACT:

The USNO CCD Astrograph (UCA) started an astrometric survey in February 1998 at Cerro Tololo, Chile. This first, preliminary catalog (UCAC1) includes data taken up to November 1999 with about 80% of the Southern Hemisphere covered. Observing continues and full sky coverage is expected by mid 2003 after moving the instrument to a Northern Hemisphere site in early 2001.

The survey is performed in a single bandpass (579-642 nm), a 2-fold overlap pattern of fields, and with a long and a short exposure on each field. Stars in the magnitude range of 9 to 14 have positional precisions of <= 20 mas. At the limiting magnitude of R about 16 mag the positional precision is 70 mas.

The UCAC aims at a density (stars per square degree) larger than that of the Guide Star Catalog (GSC) with a positional accuracy similar to Tycho. The UCAC program is a major step towards a high precision densification of the optical reference frame in the post-Hipparcos era, and the first stage, the UCAC1 contains over 27 million stars.

Preliminary proper motions are included, which were derived from Tycho-2, Hipparcos and ground-based transit circle and photographic surveys for the bright stars (V <= 12.5 mag) and the USNO A2.0 for the fainter stars. The accuracy of the proper motions varies widely, from 1 to about 30 mas/yr.

The UCAC1 is available on CD-ROM from the U.S. Naval Observatory.

UCAC1: NEW PROPER MOTIONS FOR 27 MILLION STARS ON THE SOUTHERN HEMISPHERE

N. Zacharias, S.E. Urban, D.G. Monet, I. Platais, G.L. Wycoff, M.I. Zacharias and T.J. Rafferty

To be published in *Astronom.Gesellschaft*, proceedings of the "Star 2000" meeting, Heidelberg, March 2000

ABSTRACT:

Positions and proper motions are provided for 27 million stars in this first U.S.Naval Observatory CCD Astrograph Catalog.

This preliminary catalog is available on CD-ROM and covers approximately 80% of the Southern Hemisphere to R = 16 mag. The observing program is ongoing and full-sky coverage is expected by 2003.

OPTICAL POSITIONS OF EXTRAGALACTIC RADIO SOURCES USING THE UCAC1

M. Assafin, N. Zacharias, A.H. Andrei, and R. Vieira Martins

Presented at IAU Colloquium 180

ABSTRACT:

Extragalactic radio source positions referred to the first USNO CCD Astrograph Catalog (UCAC1) are

presented. They were derived from CCD observations taken with the 1.6-meter Cassegrain telescope at the Laboratório Nacional de Astrofísica, Brazil (LNA).

The results presented here refer to 24 radio source targets distributed mainly between -30 and -70 degree declination.

Gauss, Fiala Retire from USNO

In separate retirement ceremonies last month, two members of the USNO staff ended their long and distinguished careers with the Observatory.

F. Stephen ("Steve") Gauss grew up in Marblehead, Massachusetts. Inspired by observing the moon through a neighbor's telescope, he wrote a career book in the 7th grade on becoming an astronomer. His enthusiasm was enhanced when he and his father built a 6-inch reflector, which he still has. Graduating from Cornell University in 1963 with a major in astronomy, he was recruited for the Naval Observatory by his freshman lab instructor. He was one of the first summer interns in 1962 and returned for a permanent position in the Six-Inch Transit Circle Division in 1963. Under the guidance of Bob Rhynsburger he learned to observe with the transit circle, to reduce the observations each night and to compute positions and proper motions for the observations, while Benny Klock gave him an appreciation for the superb mechanical quality of the transit circle and the extreme care needed when working with the instrument. He produced proper motions for the W350 transit circle catalog and for a set of early type stars recommended for study by Adrian Blauuw.

As one of the first USNO employees to have taken a computer course in college, the division director, Norwood Adams, asked him to investigate the possibility of computerizing the transit circle. This led to several years' work culminating in 1968 with the IBM 1800 taking over from the electro-mechanical Datex system that had been used to produce paper tapes. His work on the computer system continued with the transfer of all the processing programs from the observatory's IBM 1410 mainframe to the control computer, so that, for the first time, the results could be made available immediately following the night's observing, rather than several days later. He continued to improve the six-inch control computers while also designing and implementing the computers for the automatic transit circle and the seven-inch transit circle, which went to New Zealand.

Steve was chosen to head the Instrumentation Division and became the head of the Astrometry Department in 1993. Since that time the Department has seen some major success stories, including the UCAC program being carried out in Chile, the publication of the AC 2000 and ACT catalogs and the collaboration with the European Space Agency on the Tycho-II catalog, the proliferation of double star data from the Speckle camera and the first results from the NPOI.

Steve has received the Superintendents Award and the Gilliss Award from the Naval Observatory. He was a founder of the HP computer users group, Interex, and he is the only person to receive their Hall of Fame Award twice. He is also proud of his work with the Boy Scouts, having led the Montgomery County training team for adult leaders four times and receiving the District Award of Merit.

Steve accepts his Distinguished Service Award from the CO

Alan Fiala was born in Beatrice, Nebraska on November 9, 1942. He expressed a desire to become an astronomer since pre-kindergarten days. He received his B.A. degree (summa cum laude) from Carleton College after three years, with a major in astronomy and minors in physics and mathematics.

In 1962, Alan obtained his first job, as a summer intern at the Naval Observatory, working in the Nautical Almanac Office (NAO). This exposed him to celestial mechanics and astrometry, so that in 1963 he chose to enter the graduate program at Yale University. His Ph.D. dissertation was on *Determination of the Mass of Jupiter from a Study of the Motion of 57 Mnemosyne*. He continued to work summers at USNO while pursuing his Ph.D., setting a long-held record of 7 summer appointments. After receiving the Ph.D. in 1968, under Prof. Gerald Clemence, he became a permanent member of the staff.

Alan began work in the NAO at a time when programmable computers were just being introduced. He participated in the automation of many procedures used to prepare the annual publications, and also programmed the first pen-and-ink plotter to prepare diagrams. He developed the software for calculating eclipses and plotting the eclipse maps that is still the basis of the current preparation 25 years later. He was assigned to do the eclipse sections of the publications, and the solar eclipse circulars, and was the co-author of 14 eclipse circulars 1975-1991 until the program was terminated. During that period, he was considered one of the world's experts on solar eclipse calculations. He was the lead author of the chapter on eclipse calculations in the new *Explanatory Supplement*, and was invited to be co-author of a *Canon of Lunar Eclipses* by Liu Bao-Lin, the foremost Chinese expert.

In 1979, Alan began a collaborative effort with colleagues from several other institutions to observe solar eclipses in order to detect long-term variation in the solar diameter, and tie it to climatological records in search of its effect on the global environment. He was a pioneer in the use of small portable video cameras to record Baily's Beads from the edges of central tracks, and has been leader or co-organizer of expeditions to ten central eclipses around the world. He has been co-author of several articles on this project, and it still continues.

Alan has been a member of the Nautical Almanac Office, Orbital Mechanics Department, and Astronomical Applications Department. Supervisory positions held included Chief of the Astronomical Data Division in the NAO, Deputy Director of OMD, and most recently, Chief, Nautical Almanac Office in AA. He received numerous awards during his career at the Observatory, including the Captain James Melville Gilliss Award in 1999.

Alan is a member of the International Astronomical Union, the American Astronomical Society, the Division on Dynamical Astronomy (of which he was Chair during its 25th year), the Institute of Navigation, and several other professional societies.

Alan has many interests outside of work. He was active in amateur sports car racing 1972-1995, and then continued as a volunteer official in scrutineering, or technical inspection. He has been active in three citizens associations and held office and worked on committees for all of them nearly continuously. He has been active in a national organization for people with post-polio syndrome and been invited to write articles, speak or lead workshops at several national meetings. Other interests vying for time include genealogy, gardening, beekeeping, photography, grazing occultations, cooking, travel, languages, literature, and various fine and performing arts.

George Kaplan presents Alan with Citation designating Asteroid (3695) Fiala

USNO
H*A*P*P*E*N*I*N*G*S
The Vice-President Visits USNO

Clockwise from upper left: The Vice-president, Gov. Jessie Ventura, Mrs. Gore, and Mrs. Ventura enjoying the sights through the 12-inch telescope.

The Vice-president poses with the 12-inch telescope and "Flat Mason", globetrotting mascot of Ms. Casey's 3rd Grade class at George Mason Elementary School, Alexandria, VA.
(Photos courtesy Office of the Vice-president)

The Vice-president and CNN correspondent Wolf Blitzer during live broadcast of "Late Edition" from USNO Library.

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